Compound characterisation

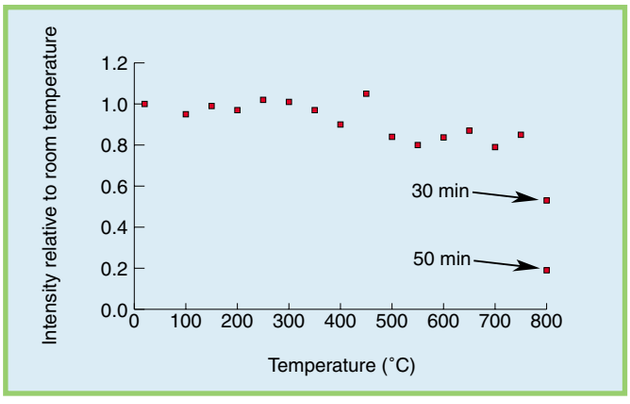

Figure: Decrease of the SL0 peak intensity versus annealing temperature.

Panalytical's X'Celerator is now available on X'Pert PRO MRD instruments for analysing semiconductors. When studying InGaN/GaN multiple quantum wells, for example, Panalytical claims that measurement time is reduced, from more than three hours to twenty minutes.

A speed boost for the X'Pert PRO MRD X-ray diffraction instrument brings ultra-fast, in-depth film characterisation to semiconductor research and process development. Adding the X'Celerator, with its RTMS (Real Time Multiple Strip) detection technology, to the X'Pert PRO MRD reduces the time needed to collect an intensity distribution in reciprocal space (reciprocal space map, RSM). It is now possible to obtain a complete analysis of a complex semiconductor layer structure in just a few hours.

One application area of high-speed reciprocal space mapping is the monitoring of rapid processes, such as temperature-induced device instabilities. As an example: Panalytical demonstrates the thermal stability of a wurtzite-type InGaN/GaN multiple quantum well. The equipment used is an X'Pert PRO MRD, with an X'Celerator detector and an Anton Paar DHS900 Domed Hot Stage. The instrument allows full software control of both the diffractometer and the temperature controller.

The sample was annealed under normal atmospheric pressure from room temperature to 800°C in 50°C steps. After each temperature step, the temperature of the sample was stabilised for 10 minutes, followed by an automatic sample alignment to the main GaN peak, in order to correct for temperature-induced variations, and finally the (11-24) reciprocal space map was collected. Data acquisition for each map was only 20 minutes, compared to more than 3 hours for a traditional set-up.

Stability of the device as a function of temperature was evaluated by calculation of the intensity ratio of the "zeroth" order reflection of the superlattice at elevated temperatures and its value at room temperature.

In the figure, this ratio is plotted as a function of temperature. Below 800ºC there is only a small drop in the variation of the intensity ratio, caused mainly by the changes of the scattering factors. After 30 minutes annealing at 800ºC, the intensity ratio started to drop and after 50 minutes had decreased about five-fold. The intensity of the GaN peak, however, decreased only by 40% due to the change of the scattering factor. In other words, the superlattice peak is gone, while the substrate peak is still visible; the layer structure is destroyed.

Veeco and the current perpendicular plane

Veeco Instruments Inc has launched an advanced engineering programme to develop a next-generation data storage thin film head sensor deposition tool, for the technology transition to perpendicular recording. To lead this programme, Dr Piero Sferlazzo has been hired as VP and GM for the advanced technologies deposition platform.

Veeco's goal is to create a new tool to integrate physical vapour deposition (PVD), atomic layer deposition (ALD) and molecular beam deposition (MBD) to allow deposition of new materials.

Dr Sferlazzo previously founded a number of companies including Fluens, Opnetics (now in Unaxis), Klee (part of Astex Corp) and Krytek (now in Core Systems). He has many years of experience in the development and management of process equipment for the semiconductor, data storage, and telecom industries.

Veeco president Don Kania, says the company "recognises that our data storage customers are looking for next-generation deposition solutions that will enable their move to current-perpendicular plane (CPP) head technology. It is Veeco's intention to develop tools that incorporate various types of deposition in order to meet this market requirement."

AXT restructures

Following recent management movements at AXT Inc, the company has announced that it is to reduce its workforce at the Fremont manufacturing facility by approximately 45 positions or approximately 35% over the next 60 days. Workforce reduction at Fremont is part of the company's previously announced and ongoing effort to consolidate manufacturing at its production facility in China. The company will record a restructuring charge of approximately $1.3 million in the second quarter related to the reduction in force and to lease costs associated with facilities that are no longer required to support production.

Bulk specialty gas supply

Praxair Chemax Semiconductor Materials Co Ltd, a JV between Praxair Inc and Chemax International Corp, has won a contract issued by LED manufacturer Epistar Corporation to supply bulk specialty gas delivery systems (BSGS) of ultra high-purity ammonia (NH^3). It is the third such contract to be awarded to Praxair by Epistar over the last five years. Praxair Electronics, a division of Praxair Inc, based in Orangeburg, NY, will fulfil the contract.

"Praxair BSGS of ultra high-purity ammonia is a reliable solution for Epistar's high volume and flow requirements. We are encouraged by its consistent performance and will employ the third contracted Praxair BSGS as the gas delivery platform for our next expansion phase," said B. J. Lee, president of Epistar.